

75080

Mare Soil
1562 grams

DRAFT

Introduction

Station 5 was located on the rim of Camelot Crater where several basalt boulders were sampled. Camelot Crater is about 650 meter diameter and the rim contained samples of the basalt flows in the Taurus-Littrow Valley. Soil sample 75080 was collected from between the basalt boulders and contained several fragments of basalt (75085-89). Basalt fragments from 75083 were dated from 3.67 – 3.75 b.y.

Petrography

The maturity index Is/FeO for 75081 is 40 (submature) (Morris 1978), however there is a substantial agglutinate component. The grain size distribution and modal lithology was determined by Butler and King (1974), Green et al. (1975) and Heiken and McKay (1974). Von Guten et al. (1979) calculated that 75081 was made of about 84% mare basalt, 7.6 % anorthosite, 1.4 % KREEP, ~7% orange glass and 0.6 % meteoritic material.

Goldstein et al. (1974) reported the composition of iron particles in 75081 (figure 5).

Chemistry

Numerous authors reported analyses of 75081 (table 1). Evensen et al. (1973) and Duncan et al. (1974) analyzed numerous size fractions of 75081.

Norris et al. (1983) reported carbon = 81 ppm and nitrogen = 39 ppm in 75080. DesMarais et al. (1975) reported 105 ppm carbon. Pillinger et al. (1974) found the carbon and metallic iron contents could be correlated.

75081 has been used to study the redistribution of volatile elements in the lunar regolith and by a nearby crater (Krahenbuhl et al. 1977, Wegmuller et al. 1980, Cirlin and Housley 1981 and Reed et al. 1977). Von Gunten et al. (1979) carefully studied the composition of 75081 as function of grain size.

Radiogenic age dating

Huneke et al. (1973) and Papike et al. (1974) have reported ages of particles from 75080.

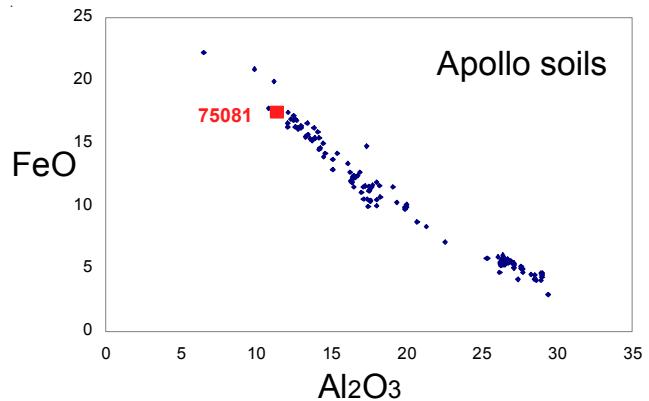


Figure 1: Chemical composition of lunar soils with 75081.

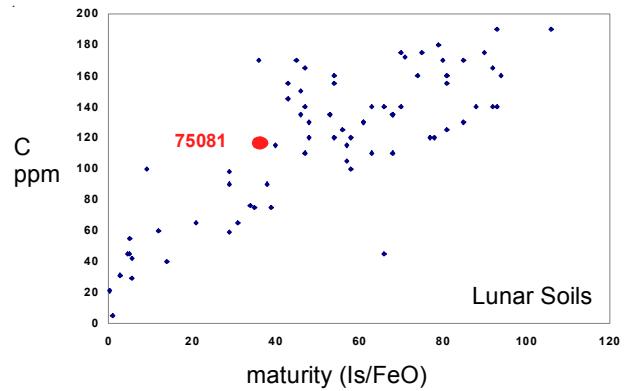


Figure 2: Maturity of lunar soils showing 75081.

Mineralogical Mode for 72501

Heiken and McKay 1974
(90 to 150 micron)

Mare basalt	19.7
feldspathic basalt	
anorthosite, norite	0.3
breccias, light	0.7
poikilitic breccias	2
mafic mineral	21
plagioclase	9
opaque	5.7
glass	5.6
agglutinate	35.3
dark breccias	0.7

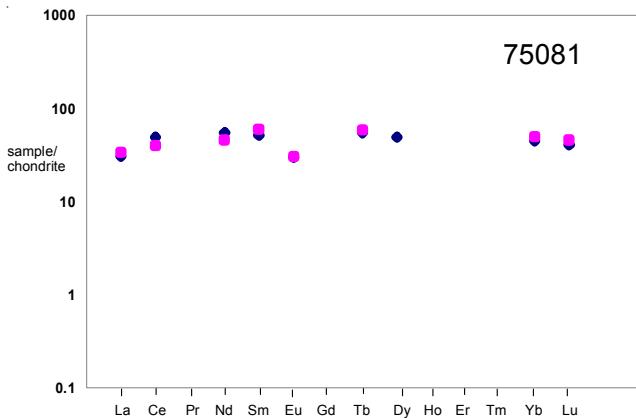


Figure 3: The trace element pattern for 75081 is like that of the mare basalt.

Cosmogenic isotopes and exposure ages

The ^{38}Ar exposure age is 310 m.y. (Huneke et al. 1973). Bull and Durrani (1975) and Goswami and Lal (1974) studied the fossil tracks caused by cosmic rays and solar flares.

Other Studies

Hintenberger et al. (1975) and Alexander et al. (1977) reported the isotopic ratios of rare gasses in 75081.

Cirlin and Housley (1981) showed that the Cd and Zn were located on the surfaces of grains in 75081 (figure 6). The spectra was obtained by Adams et al. (1974).

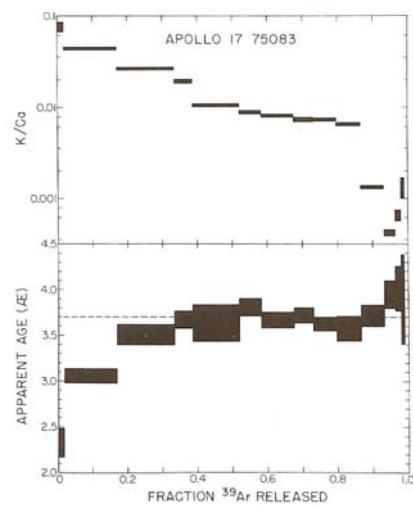
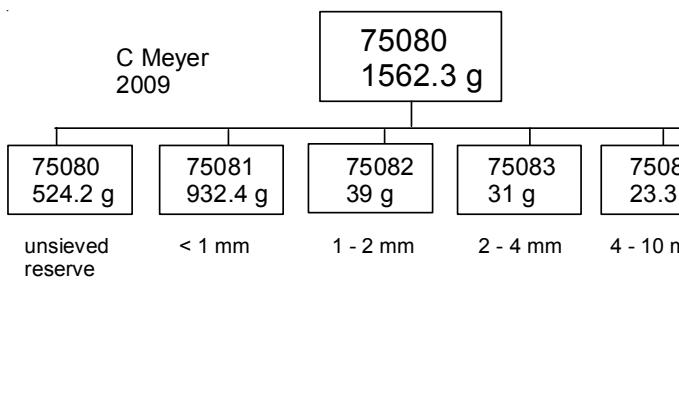


Figure 4: Ar release pattern for basalt fragments from 75083 (Huneke et al. 1973).

Summary of Age Data for 78053

	Ar/Ar
Huneke et al. 1973	3.70 ± 0.09 b.y.
Papike et al. 1974	3.77 ± 0.05
	3.75 ± 0.04
	3.67 ± 0.1
	3.74 ± 0.04
	3.68 ± 0.1
	3.68 ± 0.07

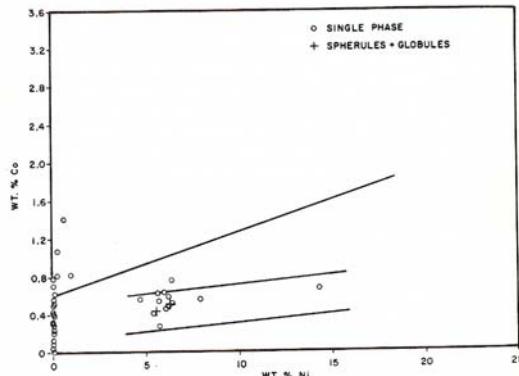


Fig. 4. Co-Ni analyses of metal particles in soil 75081.

Figure 5: Chemical composition of iron grains in 75081 (Goldstein et al. 1974).

Table 1. Chemical composition of 75081.

reference	Laul 74	Rhodes74			Korotev92			Duncan74			Evensen73				
weight		LSPET73						coarse			fine				
SiO ₂ %		40.27	40	(a)				39.73	40.06	40.03	40.65	(a)			
TiO ₂	9.4	(b)	9.41	9.4	(a)			10.45	9.89	9.73	8.33	(a)			
Al ₂ O ₃	11.3	(b)	11.31	11.18	(a)			10.18	10.25	11.03	13.77	(a)			
FeO	17.3	(b)	17.2	17.3	(a)	17.8	17.5	(b)	17.66	17.74	17.75	16.01	(a)		
MnO	0.227	(b)	0.25	0.25	(a)			0.235	0.237	0.237	0.2	(a)			
MgO	9	(b)	9.59	9.42	(a)			9.36	9.71	9.61	9.08	(a)			
CaO	10.6	(b)	10.97	10.87	(a)			11.04	10.79	10.75	10.97	(a)			
Na ₂ O	0.4	(b)	0.33	0.38	(a)	0.372	0.374	(b)	0.37	0.37	0.33	0.35	(a)		
K ₂ O	0.082	(b)	0.08	0.08	(a)			0.067	0.065	0.071	0.093	(a)	0.078 0.078 (c)		
P ₂ O ₅			0.07	0.07	(a)			0.071	0.069	0.08	0.109	(a)			
S %			0.12	0.11	(a)			0.125	0.12	0.1	0.189	(a)			
sum															
Sc ppm	61	(b)			66.9	65.9	(b)								
V	100	(b)						111	103	82	75	(a)			
Cr	2942	(b)	3147	3079	(a)	3240	3190	(b)	3360	3264	3277	3654	(a)		
Co	27	(b)				29.9	31.2	(b)	25	26	30	37	(a)		
Ni	100	(b)	140	143	(a)	50	150	(b)	68.5	87.5	116	198	(a)		
Cu								3.2	4.1	5	11.5	(a)			
Zn			35	31	(a)			12	16.8	21.8	49.1	(a)			
Ga															
Ge ppb															
As															
Se															
Rb								1.8	1.4	1.4	2.1	(a)	1.22	1.25 (c)	
Sr			165	159	(a)	170	210	(b)	149	154	164	180	(a)	163	169 (c)
Y			77	73	(a)			73.7	71.2	67.3	65.5	(a)			
Zr	230	(b)	229	211	(a)	230	180	(b)	241	235	224	238	(a)		
Nb			20	19	(a)			20.2	19.8	20.2	20.6	(a)			
Mo															
Ru															
Rh															
Pd ppb															
Ag ppb															
Cd ppb															
In ppb															
Sn ppb															
Sb ppb															
Te ppb															
Cs ppm															
Ba	100	(b)				100	108	(b)	95	89	91	112	(a)	83.7 88.8 (c)	
La	7.2	(b)				8.01	7.91	(b)							
Ce	30	(b)				24.1	24.2	(b)							
Pr															
Nd	25	(b)				21	23	(b)							
Sm	7.6	(b)				8.8	8.7	(b)							
Eu	1.7	(b)				1.75	1.7	(b)							
Gd															
Tb	2	(b)				2.15	2.17	(b)							
Dy	12	(b)													
Ho															
Er															
Tm															
Yb	7.3	(b)				8.12	7.95	(b)							
Lu	1	(b)				1.12	1.1	(b)							
Hf	7	(b)				7.82	7.64	(b)							
Ta	1.3	(b)				1.38	1.34	(b)							
W ppb															
Re ppb															
Os ppb															
Ir ppb	5	(b)				5.4	6	(b)							
Pt ppb															
Au ppb	3	(b)				6	7	(b)							
Th ppm	0.6	(b)				0.75	0.81	(b)							
U ppm						1	0.8	(b)							

technique: (a) XRF, (b) INAA, (c) IDMS

Table 1b. Chemical composition of 75081.

reference weight	Baedecker74	Korotev92	Laul78 ave ?	
SiO ₂ %		40.1	(b) 40.4	(b)
TiO ₂		9.41	(b) 9.1	(b)
Al ₂ O ₃		11.25	(b) 11.1	(b)
FeO	18.1	(b) 17.4	(b) 17.3	(b)
MnO	0.26	(b) 0.25	(b) 0.23	(b)
MgO		9.51	(b) 9.6	(b)
CaO		10.9	(b) 10.9	(b)
Na ₂ O		0.373	(b) 0.44	(b)
K ₂ O		0.08	(b) 0.08	(b)
P ₂ O ₅		0.07	(b)	
S %		0.12	(b)	
<i>sum</i>				
Sc ppm	67	(b) 66.4	(b) 67	(b)
V			100	(b)
Cr	3000	(b) 3220	(b) 2942	(b)
Co	33	(b) 30.6	(b) 30	(b)
Ni	125	(d) 100	(b) 110	(b)
Cu				
Zn	26	(d) 33	(b) 35	(b)
Ga	5.1	(d)	6.4	(b)
Ge ppb	207	(d)		
As				
Se				
Rb		1.1	(b)	
Sr		164	(b) 160	(b)
Y		75	(b)	
Zr	251	(b) 220	(b)	
Nb		20	(b)	
Mo				
Ru				
Rh				
Pd ppb				
Ag ppb				
Cd ppb	32	(d)		
In ppb	2	(d)		
Sn ppb				
Sb ppb				
Te ppb				
Cs ppm				
Ba		104	(b) 100	(b)
La		7.96	(b) 7.7	(b)
Ce	23	(b) 24.2	(b) 28	(b)
Pr				
Nd		22	(b) 25	(b)
Sm		8.78	(b) 8.4	(b)
Eu	1.8	(b) 1.72	(b) 1.8	(b)
Gd				
Tb	2.2	(b) 2.16	(b) 2.1	(b)
Dy			13	(b)
Ho			3	(b)
Er				
Tm				
Yb	6.4	(b) 8.04	(b) 7.4	(b)
Lu		1.11	(b) 0.98	(b)
Hf	8.3	(b) 7.73	(b) 7.4	(b)
Ta	1.4	(b) 1.36	(b) 1.4	(b)
W ppb				
Re ppb				
Os ppb				
Ir ppb	5	(d) 5.7	(b) 10	(b)
Pt ppb				
Au ppb	1.4	(d) 2.1	(b)	
Th ppm	0.6	(b) 0.78	(b) 0.9	(b)
U ppm		0.2	(b) 0.25	(b)

technique: (a) XRF, (b) INAA, (c) IDMS, (d) RNAA

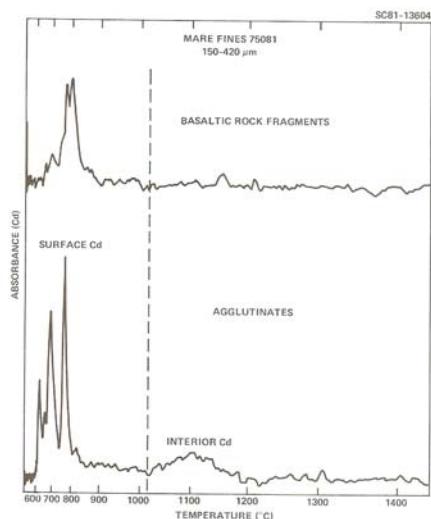


Figure 6: Cd on surface of soil particle from 75081 (Cirlin and Housley 1981).

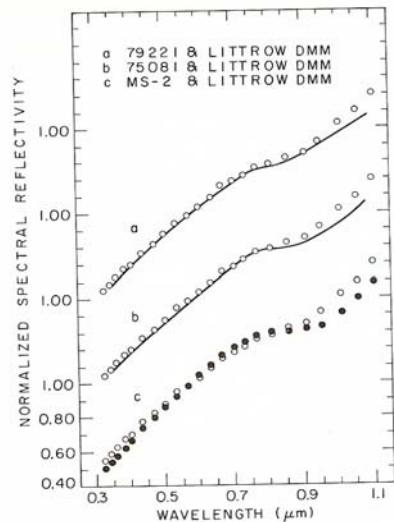


Figure 7: Spectra of 75081 (Adams et al. 1974).

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